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Oral booster vaccine against hepatitis B in the form of low-dosed lyophilised plant tissue bearing S-HBsAg VLPs

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The continued HBV high prevalence coupled with deficiencies in vaccination programmes stimulate research on a new type of vaccines. Potential orally administered plant-based vaccine is highly attractive regarding efficacy, cost-effectiveness and availability of mass hepatitis B prevention. Freeze-dried oral formulations facilitate elimination of complex purification steps, size reduction and better stability during storage, as well as ensure controlled administration regime in minimised medical facilities. Micropropagation of lettuce expressing S-HBsAg was optimised to provide repeatable uniform feedstock for plant-derived oral vaccine manufacturing. Lyophilisation protocol facilitating successful processing of lettuce leaf tissue containing S-HBsAg assembled into VLPs (Virus-Like Particles) was developed. Several drying profiles and excipients as well as effects of freezing rate and post-process residual moisture were analysed. The profile of 20°C for 20 h for primary and 22°C for 2 h for secondary drying as well as sucrose proved the most efficient stabilisation of S-HBsAg during freeze-drying. The process was highly reproducible (86-97%), and provided a product with VLP content up to 200 µg/g DW. Atmosphere of nitrogen proved to preserve S-HBsAg VLPs for minimum one year at temperatures up to 37°C. Low-dosed (5-200 ng) preparation used as oral booster vaccine elicited anti-HBs response in animals at level of commercial injection vaccine (around 1000 mIU/ml). As a result, a plant-derived semi-product with good long-term stability and immunogenicity of S-HBsAg was obtained for the definite formulation of oral booster vaccine against HBV.

Biography

Marcin Pyrski is a PhD student in Bioengineering Team led by Dr. Tomasz Pniewski in the Institute of Plant Genetics, PAS. He completed Engineering and Master's degrees in Biotechnology at the University of Life Sciences in Poznań. He had attended one year training in plant micropropagation in Floralab Company. Actually he is working with plant-based HBV antigens on their expression, functionality and immunogenicity.

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